

## Introduction by the Editor-in-Chief

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The journal *Russian Nanotechnologies* continues to publish thematic issues on topical issues that define the development of the scientific foundations of nature-like technologies. This issue of the journal is devoted to the issues of hydrogen energy and the role of nanotechnology in this area.

The relevance of the topic is due to the generally recognized need for a transition to environmentally friendly energy, where an environmentally friendly energy carrier hydrogen should take a special place. Research and development in this area is being carried out in the overwhelming majority of countries, but in recent years special attention has been paid to it in Europe, the USA, Japan, China, and other industrialized countries with a high level of research potential. Many of these countries have government clean energy programs.

The USSR was a leader in the field of hydrogen energy, but economic problems slowed the development of work in this area. However, this has changed recently. President of the Russian Federation V.V. Putin has pointed out the need to concentrate resources on the development of nature-like technologies, in particular on the development of hydrogen energy. On behalf of the government of the Russian Federation, the Ministry of Energy of the Russian Federation is preparing a program of work in the field of hydrogen energy in the Russian Federation with the involvement of leading scientists and specialists. Such major Russian companies as Rosatom, Gazprom, RusHydro, and others are showing significant interest in this area. At the same time, the development of work on hydrogen energy provides for close cooperation with foreign companies and research organizations.

This issue contains both review articles on hydrogen energy and hydrogen technologies, including a review of the history of the development of hydrogen energy in the USSR and Russia, and original articles by scientists from leading organizations in this field.

The recent results of research and development in the field of nanostructured electrocatalysts on various types of nanocarbon and oxide carriers for low-temperature electrolyzers of water and fuel cells are con-

sidered. Graphenes and graphene-like materials, as well as methods for their modification, are considered in the most detail. Along with this, considerable attention is paid to modeling the processes in these electrochemical systems in order to ensure their start-up at low temperatures and to maintain the optimal water balance in the systems. This is of great interest for the use of electrochemical systems for the storage and generation of electricity in the Arctic region. Research on noise diagnostics of fuel cells with solid polymer electrolyte is of undoubted interest.

The results of theoretical and experimental studies in the field of high-temperature electrolyzers and fuel cells and, in particular, nanostructured anodes are presented.

Attention is paid to the development of the design of nanostructured catalysts for the conversion of fossil and renewable fuels.

Recent research results on new hydride-forming materials and their composites with carbon nanofibers, which provide a significant increase in thermal conductivity, are presented. Along with this, the literature data were analyzed on the possibility of using graphenes and graphene-like materials for purifying and accumulating hydrogen.

The application of electrochemical and catalytic technologies for related processes of hydrogen isotope exchange and concentration of atmospheric oxygen is considered, which is very important for solving environmental and medical problems.

Problems of normative, experimental and theoretical calculation of the safety of hydrogen energy are not neglected.

Of course, in one issue of a journal it is impossible to touch on all of the main areas of hydrogen energy, but the range of problems considered is quite wide.

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